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Effect of record keeping practices on dairy farming business performance in Kiambu County: a case of Kiambaa Constituency.

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EFFECT OF RECORD KEEPING PRACTICES ON DAIRY FARMING BUSINESS PERFORMANCE IN KIAMBU COUNTY: A CASE OF KIAMBAA CONSTITUENCY

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

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ABSTRACT

Studies have revealed that maintaining accurate farm records is a prerequisite for improved business performance irrespective of the nature of the farming activity that a farmer engages in. This study examined the existing record-keeping practices and their impact on business performance among smallholder dairy farmers in Kiambaa constituency of Kiambu County. The practices examined were the types of records kept, the methods used to keep them, and the frequency of recording. Business performance was measured using annual milk revenue. The study was underpinned by the profit maximization and competition-based theory as well as the Porter's generic strategies. The study targeted a randomly selected sample of 400 farmers out of a population of 4800 dairy farmers drawn from the Kiambaa Dairy Farmers Cooperative Society. Factor analysis and regression analysis were used to model the relationship. Data was analyzed using Statistical Package for Social Sciences software. The general conclusion was that the type of record kept, frequency of record keeping, and method of record keeping had a positive and statistically significant effect on dairy farming business performance. The study recommended that the County Government of Kiambu conduct intensive smallholder dairy farmer training on the importance of record keeping and digital literacy through the extension department since agriculture is a devolved function. Also, financial institutions like Kiambaa Dairy Farmers Cooperative Society sensitize the farmers on the importance of good record-keeping practices. System developers should come up with simple, economical and standardized digital systems for recording to enable the smallholder dairy farmers maintain different types of records and update them on a daily basis in order to accrue the benefits that come with use of real-time information.

Keywords: Record keeping; Smallholder farming; Dairy farming; Kiambaa Dairy Farmers' Cooperative Society; Kiambu County

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LIST OF ABBREVIATIONS

AI	Artificial Insemination
ANOVA	Analysis of Variance
CIDP	County Integrated Development Plan
GDP	Gross Domestic Product
ISO	International Organization on Standardization
KDFCS	Kiambaa Dairy Farmers Cooperative Society
KMO	Kaiser-Meyer-Olkin
KNBS	Kenya National Bureau of Statistics
KNDMP	Kenya National Dairy Master Plan
KPI	Key Performance Indicator
OLS	Ordinary Least Squares
RCT	Record Continuum Theory
SHF	Small Holder Farmers
SMT	Strategic Management Theory
SPSS	Statistical Package for Social Sciences
SSA	Sub Saharan Africa
USAID	United States Agency for International Development
VIF	Variance Inflation Factors

CHAPTER ONE: INTRODUCTION TO THE STUDY

1.1. Background

Record keeping is the maintenance of the history of one's activities through organizing and storing of documents and information related to the business. It allows for the documentation and writing of material for future references through either traditional manual recording or advanced computerized recording, or both. Records serve as the primary tools of reference when it comes to confirmation, analysis, and decision-making on how efficiently a business can continue to be run.

Record keeping in the dairy context is therefore a document that allows farmers to keep an account of different transactions in their dairy farms. It can be operationalized based on several practices such as the type of records kept, the method used to record, and frequency of recording (Yadeta et al., 2020). Type of record refers to the 'what', method refers to the 'how' and frequency refers to the 'how often' the various categories of information are captured.

Among the types of records a dairy farmer should keep include, Financial, Production, cattle identification, Farm Input, Animal Feeds, and Health records (Yadeta et al., 2020). Cattle identification records capture the breed of the cattle and calves' age, sex, sire, and dam. Financial records advise the business owner on input costs, cash flow, utilities, and sales to boost yields. From the records, they can project how much an individual cow will consume and decide how to improve and project sales revenue. Production records are useful in the documentation of all the production in the farm's daily, weekly, monthly, and annual production levels. These records are very important to the farmer to determine which combination of the farm animals could produce more productive offspring. It can also indicate what level of milk production for a given cow they should target before they end up drying a cow and wasting food. Milk production records have details like quantity of production, fat and protein percentage, and the somatic cells for each cow. Health records include reproductive, animal treatment, vaccination, breeding, and diseases the animal has had. Animal feed records are an essential component of the dairy business because both the amount and composition of feeds determine the milk production of a cow. The records help track the cost of feed given to the cows. Using these records, animal health could be

improved by giving different feed types and amounts thus helping management with the administration. Farmers can use such records to plan on daily food input requirements (Yadeta et al., 2020). Farm input records help in monitoring costs, therefore improving efficiency and saving on spending. The inputs are from a wide range varying from fertilizers, seeds, minerals and other inputs. The records include tracking of their use and rate of use. Daily farm records help in tracking ongoing activities as well as planning for future ones. Staff records on the other hand assist in keeping labor-related records (Yadeta et al., 2020).

The methods used in capturing and recording data can be automated/computerized systems or hand/manual systems. The manual system is, however, time-consuming especially where decisions have to be retrieved and actioned in a short time. It is a method of record-keeping that would be useful for smallholder farmers (Moran, 2009). Computerized systems are considered to be accurate and powerful analysis tools compared to hand systems, thus helping the farmer make informed decisions that eventually translate into better performance (Holland, n.d.). The choice of the kind of system to implement is dependent on how big a farm is, how the records are used, and the amount the farmer is prepared to invest in the automation of the farm. At a minimum, an efficient system should be reliable, and consistent and provide accurate information (Yadeta et al., 2020). The use of an automated system allows an easier way of tracking the management records, easier condensation of the records and eventual increase and improvement in quality of the decisions made at any given time (Yadeta et al., 2020). In addition, automated system allows for ease of gathering large data and makes it easy to print reports while providing charts that are easy to read. (Moran & Chamberlin, 2017).

The frequency of record keeping is the rate at which farmers update their records. Those who update regularly stand a better chance of having higher productivity compared to those who don't (Jeyabalan, 2010). The frequency of record-keeping is a key determinant of dairy farm success (Dudafa, 2013). Among the frequency constructs, daily record-keeping is considered the best because it ensures all transactions are captured, is less stressful because the records are few, and is easy to track. Weekly records are also good but have a slight chance of error in case of missing records and increased bulkiness. Monthly record-keeping is okay but not the preferred

option due to possible omissions in recording, delays and poor tracking of activities (Jeyabalan, 2010). Biannual recording may lead to business struggle and eventual failure due to difficulty in tracking many records and omission errors. Annual record keeping should be discouraged at all costs because the business would be running like a hobby without emphasis on professionalism, losses would be harder to track and patterns of business failure would become impossible to notice (Yadeta et al., 2020).

Business performance is the aptitude of an enterprise to accomplish the purpose for which it was formed using the resources applied. It is the current actions that lead to future results in a business (StudySmarter, 2022). It is measured using an entity's Key Performance Indicators (KPI) which differ from one entity to another. Examples of KPI include milk production levels, milk revenue, profitability, sales volume, customer base, and market share among others (Moran & Chamberlin, 2017). Various indicators have been developed to help dairy farmers measure their performance and establish the possible causes of insufficient farm performance. For a farmer to know how good or bad they are performing, they must be armed with knowledge that can only be made possible through record-keeping. Dairy farm performance indicators are also useful in identifying weaknesses in farm performance as well as making targets (Moran & Chamberlin, 2017).

Smallholder dairy farming

Approximately 150 million families globally practice dairy farming which contributes to their livelihoods, food security and nutrition. India is the most prominent milk producer globally. It is followed by the United states of America (USA), Brazil and Pakistan (FAO of the United Nations, n.d.). Milk is mainly produced by small scale farmers in the developing nations (FAO of the United Nations, n.d.). South Asia region (including India, China, and Pakistan) is the global regional leader in milk production (Global Dairy Sector: Status and Trends, n.d.). Majority of dairy farms in most countries in Asia keep up-to ten (10) cows with most farms having between one (1) and five (5) cows (Global Dairy Sector: Status and Trends, n.d.).

In Africa, smallholder dairy production is practiced by farmers who own less than 10 herds of cattle and between 2 and 10 hectares of land. These farmers contribute 80% of the dairy production under varying circumstances depending on climate, availability

of feeds, production resources, market channels and consumer demand in an area (Ojango et al., 2017). The farming is practiced under either pastoral, extensive mixed, intensive mixed or industrial systems. Breads reared range from local, crosses and exotic imports (Ojango et al., 2017). It is therefore a critical economic activity that provides regular earnings, enhances household nutrition, provides food security and creates employment (Moran, 2009).

In Kenya, smallholder dairy farming is a dominant economic activity that is practiced on small farms with a flock of pure breeds, crosses or both, ranging between one (1) and five (5) cows. The milk is marketed through both formal and informal subsectors (Waitituh, 2017). It supports more than 1.4 million smallholder farmers (SHF) who contribute more than 70% of milk from high-potential, middle-potential, and pastoralist areas across the country (KNDMP, 2010). It is characterized by daily cutting and direct feeding of cattle in their pens, mostly on hay supplemented with commercial concentrate, or grazing in pastureland (USAID, 2019). The farmers keep cross-bred dairy cows under zero grazing or partial grazing systems. The different systems are determined by factors like climatic conditions of the region, the yield of the given piece of land, and the dominance of animal diseases (USAID, 2019).

Kiambu is the leading County in milk production in Kenya (Kenya news agency, 2021). Dairy farming is therefore a predominant source of livelihood for the residents of the County. It is practiced in both large and small scale. However, the dairy producers are mainly smallholder farmers who market their produce through member cooperatives (County Government of Kiambu, 2018). Dairy farmers in Kiambu district which is within Kiambu County have organized themselves into two dairy farmers' cooperative societies; Ndumberi Dairy farmers Co-operative Society and Kiambaa Dairy Farmers Cooperative Society (KDFCS) (Simbe, 2012).

KDFCS is a producer-cooperative society which was formed in 1963. It collects and sells milk from 4,800 members. The society is situated in a suburban setting and neighbors Nairobi, the capital city of Kenya. Due to the high population growth in the area, the current average land holding is one (1) acre and is diminishing, necessitating the smallholder farmers to adopt zero-grazing dairy farming. Increased demand from the city's diverse market segments has led to an increase in milk production trends and

an improvement in prices. Smallholder dairy farming production and marketing is prospering in the area with each farmer having an average of two (2) cows with a daily milk production of about 10 kilograms of milk per cow (Simbe, 2012).

This study sought to specifically assess the record-keeping practices (i.e. types of records kept, method applied to keep them, and how frequently the recording was done) by smallholder dairy farmers in Kiambaa constituency as suggested by the literature. Besides, it sought to generally assess the influence of the recordkeeping practices on dairy farm performance amongst these smallholder farmers in Kiambaa constituency which is in Kiambu county. Kiambu county was chosen for the study because it is not only an agro-ecologically representative of high agricultural potential areas in Kenya (Mwaura, 2006), but is also the leading county in milk production in Kenya (Kenya news agency, 2021). Kiambaa Dairy Farmers' Cooperative Society was chosen as an area of study because it is one of the cooperatives in Kiambu county where smallholder farming is largely practiced.

In measurement of dairy farm performance, this study used annual milk revenue as a measure of dairy business performance. This is because the revenue per liter of milk sold may not significantly differ among the farmers because milk is a homogenous product.

1.2. Problem statement

About 1.02 billion liters of milk production in Kenya comes from smallholder farmers (Waitituh, 2017). Despite this great contribution, most smallholder dairy farmers do not practice any form of record-keeping for their farms. They are not keen on maintaining business records despite their (record's) importance in performance evaluation (Bridget, 2012). It is actually not easily evident to many farmers how recordkeeping contribute to the overall performance of their farms (Chiumia et al., 2020). Farmers therefore have an attitude to not keep any records at times or are biased towards only keeping certain types of records (Ogola et al., 2023). This means the benefits that would ordinarily accrue to the dairy businesses as a result of record keeping are lost (Tham-Agyekum et al., 2010).

Despite the huge potential of the dairy sector in Kenya, most smallholder farmers do not keep records of their farms. Recording is low due to challenges like lack of motivation to record, inadequate funding, inadequate response on records, unsupportive farm structure, unskilled workers, and lack of supporting guidelines. (Kosgey et al. 2011). Most farmers tend not to have undergone formal training and therefore face the common challenges of not keeping records (Bridget, 2012).

One of the common problems that arise from lack of records is inability to access financial credit (Devonish et al., 2002). This is because financial institutions require that their clients have proper records to allow them determine their financial position before offering financial services (Moran, 2009). Inadequate farm records therefore aggravates the inability of financial institutions to lend to smallholder farmers (Kiplimo et al., 2015). In addition, farmers without records miss out on essential management practices and recipes for future farm improvement which would help them to better manage their livestock health and growth, monitor farm's progress as well as assess past farm performance. This way, failure to maintain records become both a production and viability constraint (Ergano & Nurfeta, 2006).

Dairy performance in the country has been on a downward trend in the past half-decade with many cows producing between 8-12 liters a day, significantly affecting the revenue obtained by the farmers (County Government of Kiambu, 2018). This has been linked to lack of well-organized record systems amongst several other factors like bad infrastructure, damaged physical facilities, poor hygiene, scarce budgetary allocations, substandard feeds, disorganized purchasing system, untrained workforce, and limited incentive for good workers (Ergano & Nurfeta, 2006).

To keep proper records, farmers need to have a good understanding of how to prepare the records, or better have professionals do it for them. The latter option would be considered expensive where the farms can only generate little to moderate revenue. Some studies have attempted to establish a causal link between record-keeping and farm performance. A study on the status of farm record-keeping practices focused on farmers in general agriculture in Anand district in India (Prajapati et al., 2015). According to the study, those who kept records accrued the benefits of proper planning and identifying strengths and weaknesses from the records. Another study investigated

farm record-keeping behavior among small-scale poultry farmers in Ghana (Tham-Agyekum et al., 2010). The study showed that all farmers kept financial and production records, but fewer of the other records were kept as the farmers felt they would not be beneficial (Tham-Agyekum et al., 2010).

Narrowing down to Kenya, most studies have primarily concentrated on general farm management practices or the adoption of technology in record-keeping practices. A study on the effects of patterns of adoption of dairy farming technologies was conducted amongst small-scale farmers in the Githunguri division, Kiambu County (Kimunya, 2014). The study focused on breeds, breeding, feeding, and animal health technologies (Kimunya, 2014). Another study evaluated dairy cattle performance amongst the smallholder farms in Nyeri County (Ajok, 2020). The study assessed feeds, feeding, young and growing stock, reproductive and production performances (Ajok, 2020). Gichohi (2020) conducted a study similar to this one in Kenya on the role of record-keeping and maintenance in enhancing decision-making among smallholder dairy farmers in Murang'a. This study, however, paid attention to the role of record-keeping in decision-making as opposed to business performance.

In Kiambu county, dairy farming is a predominant source of livelihood that is practiced in both large scale and small scale. However, the dairy producers are mainly smallholder farmers who market their produce through member cooperatives (County Government of Kiambu, 2018). Notably, dairy farmers are yet to embrace dairy production fully as a business entity hence underutilizing the potential of dairy farming to achieve maximum profits to transform their livelihoods. The dairy farmers in Kiambu County are faced with diverse challenges stretching from poor management skills in rearing dairy cows, improper feeding procedures, bad infrastructure, unaffordable cost of feeds, and lack of steady milk prices (County Government of Kiambu, 2018).

The farmers have embraced practices such as paddocking and semi-zero grazing. These practices do not guarantee adequate food nutrients to the dairy animal for it to produce its full potential. The farmers in the county have performed below their potential in milk production due to many challenges, consequently meeting only a third of its potential (Rademaker & Lee, 2017). In addition, some of the dairy farmers do

not collect any form of data concerning their cattle, production, and finances and thus may experience a hard time in the identification of problem areas, a factor that can be costly. Interestingly, some farmers have reported making crucial decisions based on estimations, which can result in a wide margin of error (Rademaker & Lee, 2017).

This study sought to understand the record-keeping practices and their effects on business performance. The practices chosen were informed by the previous international, local and regional studies.

1.3. Research Objectives

The general objective of this research is to determine the effect of record-keeping practices on dairy farming business performance amongst the smallholder farmers in Kiambaa constituency.

Specific Objectives

i. To examine the types of records kept among smallholder farmers in Kiambaa Constituency.
ii. To assess the methods of record keeping among smallholder farmers in Kiambaa Constituency.
iii. To assess the frequency of record keeping among smallholder farmers in Kiambaa Constituency.

1.4. Research Questions

i. What effect does the types of records kept by the smallholder dairy farmers in Kiambaa constituency have on their business performance?
ii. What impact do the methods of record keeping adopted by the smallholder dairy farmers of Kiambaa Constituency have on their business performance?
iii. What impact does the frequency of record keeping among smallholder farmers in Kiambaa Constituency have on their business performance?

1.5. Scope of the Study

The study focused on learning the practices of record keeping and their impact on business performance among smallholder dairy farmers of the Kiambaa constituency. The scope was narrowed to Kiambaa where smallholder dairy farming is highly

practiced (Simbe, 2012) yet little research on record keeping among smallholder dairy farmers exists. Smallholder farmers practicing dairy farming were involved in the study. The study population was drawn from members of Kiambaa Dairy Farmers Cooperative Society (KDFCS) which has a total of 4,800 members. (Source: Kiambaa Dairy Farmers Cooperative Society). From this population, 400 farmers were involved. The unit of analysis was the smallholder dairy farms. Data on milk revenue and recordkeeping practices collected was in relation to the last one year. The performance of the sampled farmers was analyzed to establish the relationship between recordkeeping practices and business performance.

1.6. Significance of the study

The county government of Kiambu - The findings of this study will be significant to the agriculture department in the county government of Kiambu. The extension and agricultural officers working with the government can use the information for planning and designing programs necessary to enlighten and sensitize farmers on areas of record keeping, farm management, and productivity.

Smallholder dairy farmers - The study will provide insights to dairy farmers who might not have understood the importance of record keeping and how they can benefit from maintaining proper records. The study will help in providing farmers with information on some of the benefits they are missing out on as well as highlight some of the available good record-keeping practices that are being employed by fellow farmers.

Financial institutions and service providers

The findings of this will help lenders and other financial service providers make informed decisions regarding lending and other services to farmers. In addition, professionals in the financial and accounting field will get valuable insights into some useful systems they would develop targeting smallholder farmers in the dairy sector.

1.7. Chapter Summary

The contribution of the dairy sector is highly acknowledged in the Kenyan economy. A significant amount of milk production in the country comes from the smallholder

farmers who rely on this economic activity to support and transform their lives and livelihoods. Record keeping in dairy farming is a critical management practice as it is key in not only evaluating performance but also in injecting professionalism. Past studies have pointed to challenges in the area of record-keeping. It is for this reason that this study finds it important to assess the status of recordkeeping and its impact on business performance. The study focuses on Kiambaa constituency where smallholder dairy farming is highly practiced.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

This section includes a comprehensive analysis of concepts and empirical works conducted on the effect of recordkeeping practices on dairy business performance among smallholder farmers. The section explains the concepts, theories and empirical reviews that are relevant to this study. The empirical review encompasses international, regional as well as local studies. It identifies the gaps and presents a conceptual framework for this study. Previous studies undertaken within similar contexts show how this study intends to fill the gap identified.

2.2. Conceptual review

The International Organization on Standardization (ISO) 15489 defines a record as information that is made, acknowledged and preserved as material proof to support a lawful obligation or a business transaction. The ISO stipulates that recordkeeping involves creating and capturing records over a span of time, as well as actions geared towards protecting the records' integrity, validity, reliability, and usability. This is notwithstanding the structure or form, and it cuts across all types of businesses and environments. Records therefore serve as evidence of business transactions as well as an information asset. Among other benefits, record-keeping helps a business make informed decisions, manage risks and reduce costs.

The Record Continuum Model (RCM) stipulates that a record undergoes through the management and archiving phases. Record management is where information is received, cataloged, maintained, and transferred to the archive. Archiving involves receiving records into archive, indexing, presentation, and finally use of records by internal and external sources (Atherton, 1985). Porter designed the generic strategies which stipulate that for any business to maximize profits, it should focus on either cost leadership, differentiation or focus (Porter, 1985). A business can differentiate itself by adopting a good recordkeeping strategy to control costs, maximize revenues, and eventually maximize profits.

The cost of good record keeping is way less compared to the losses arising from improper recordkeeping. And despite the cost, a business that maintains good records benefits in many ways including: the ability to make informed decisions; access to

credit; discharge accurate tax payments; determine financial position; manage debtors and creditors; and more importantly know how the business is performing (Aladejebi & Oladimeji, 2019).

Record management has faced a lot of challenges in various sectors in Sub-Saharan Africa and the problem continues to increase unabated. Some of the problems include a lack of record management policies and procedures; regular loss and misplacement of records; poor storage; attack by pests; lack of access controls; lack of retention and disposal schedules; failure to track record movement; unauthorized access; alteration and copying; lack of recording system, among others (Nengomasha, 2013).

In dairy farming, record keeping is the process of gathering detailed information on a farm's daily operations, revenues, and expenditures (Tham-Agyekum et al., 2010). The records can be kept in a manual or automated form, and assist in financial planning, evaluating farm activities, extension purposes, and general livestock management (Yadeta et al., 2020). It allows farmers to track their cost of inputs and check it against the output. Farmers are therefore able to determine their profitability positions and solvency. Records also allow farmers to access credit facilities (Macharia, 2018), prepare accurate tax reports, and make adjustments that increase profitability (Arzeno, 2004).

When farmers practice record keeping as one of the management strategies and goes ahead to keep accurate and detailed records, they are able to know their business weaknesses and get an opportunity for improvement. This provides a platform for self-evaluation and may thus be useful in enabling the farmer to set business targets (Kahan, 2013). Using production and financial records, farmers can improve their margins by either minimizing the costs especially the variable costs, increasing gross products such as the number of cows, or a combination of the two (Ringwall, 2015).

Good recordkeeping practices may drive a farm into cost leadership. For example, a strategic plan may involve the management or business owner's initiative to mobilize low-cost and/or higher quality resources that are organized in suitable and efficient quantities and combinations. In this regard, a farmer needs to have proper records of resource utilization in order to allocate them efficiently and monitor their progress. A

farmer can differentiate his products through value addition and further increase business returns through charging higher prices (Koech, 2023). Value addition involves improvement of the economic value of milk by changing its form, place or time characteristics (Mamo et al., 2014).

Although good record-keeping practices positively affects business performance, it is not the sole reason as other factors like customer relations, innovation and employee relations have to be considered to guarantee overall business performance (Wadesango, 2015). Furthermore, farmers will only capture, use and preserve records if they have basic information literacy skills, recordkeeping literacy skills, and understanding of the usefulness and importance of the records (Hessami, 2024). Without proper training, a farmer may not reap the benefits due to lack of knowledge on how to analyze the data in the captured records. If they loosely make documentation of their business transactions, the vague documentations may lead to making uninformed decisions that would impact negatively on their business performance (Devonish et al., 2002).

2.3. Theoretical Literature Review

This section presents the theories that closely fit this study. These are Profit maximization and competition-based theory and porter's generic strategies.

2.3.1. Profit maximization and competition-based theory

The theory is premised on the belief that an enterprise mainly aims at maximizing returns while excelling in comparison to its rivals in the long run. It is one of the Strategic Management Theories (SMT) among other theories like; resource-based theory, agency theory, survival-based theory, contingency theory, and human resource based theory, (Omalaja & Eruola, 2011). It postulates that businesses strive to maximize profits through charging higher prices or reducing production costs. The theory can be traced back to Adam Smith's assertion that any business would act in self-interest to maximize profits which eventually aggregates the benefit for the society it operates in (Abdullah, 2010). The theory therefore assumes that smallholder dairy farmers aim to maximize their profits and thus efficiently carryout their production activities. Profit is a result of the difference between total revenues and total cost. The smallholder farmers maximize their profit through growing their revenue and/or

lessening costs (Masuku et al., 2014). As averred by Musah and Ibrahim (2014), having proper record-keeping practices can boost business efficiency which can in turn influence business performance.

This theory was used in this study as it puts emphasis on profit maximization which is correlated to the independent variable i.e. business performance, measured in terms of annual milk revenue in Kenya shillings. Profit being a function of revenue and cost, the revenue component would be assessed to understand dairy business performance in terms of annual milk revenue in Kenya shillings as the dependent variable against the type, methods and frequency of recordkeeping as the independent variables. Therefore, the study will endeavor to ascertain the extent to which recordkeeping practices can influence revenue to maximize the profit of dairy farming businesses in Kiambaa constituency of Kiambu County.

2.3.2. Porter's generic strategies

Michael Porter furthered the Profit maximization and competition-based theory through 'Porter's generic strategies'. The generic strategies point that though profitability is necessary, it is not sufficient for sustainable competitive advantage. Instead, long-term business success requires to have competitive advantage through creation of a unique value proposition. Value can be created through any of the three elementary strategic options i.e. cost leadership, differentiation or focus (Porter, 1985).

Cost leadership is achieved by, either increasing returns through reduction of costs, or through increasing market share by charging low prices. It entails production of standard goods at lower cost than the rest in the same industry. Cost benefit may arise from efficiency in production, technology, raw materials among others. A business with cost leadership and selling its products at market price will get higher returns and perform above the industry average (Porter, 1985). Cost leadership is mostly effective in circumstances like when: products are identical and easily available from any seller; product differentiation is difficult; the product is homogenous; product switching cost is low; and/or bargaining power of buyers is high. This strategy results into reduced and controlled costs that positively impact the business performance (Islami et al., 2020).

Differentiation is where a business appeals to buyers by adopting an attribute that is important and unique. This allows the business to sell more of its products (Porter, 1985). Differentiators can arise at any stage in the value chain activities. This may include procurement of raw materials, logistics, day to day operations, marketing, technology and other support activities (Islami et al., 2020). Indirect activities like inspection, maintenance and scheduling are also great differentiators. Differentiation may be driven by the choices a business makes e.g. choice of technology, inputs procured and record keeping among others. This results into selling products at a premium price that covers the cost of differentiation (Porter, 1985). Differentiation is achieved through making a product different and more attractive than those of the competitors (Islami et al., 2020).

Focus strategy is where a business targets a specialized market in an industry by tailoring its strategy to serving the specialized market in exclusion of others. The focuser must understand the niche and either develop low-cost or specialized products for that market (Porter, 1985). Focusing strategy is most suitable when: the niche market is large, profitable or growing; niche is not crucial for success of large market players; market leaders consider niche too difficult to balance with the main market; or when few rivals are interested in venturing into the niche market (Islami et al., 2020).

Businesses need to have a strategic plan to realize these options. The idea is that the sole purpose of businesses is to maximize profit, especially in the long run, and achieve competitive edge against the peers in the external marketplace. However, to achieve this, a business needs to put several measures in place internally. Thus it must make strategic choices to influence external outcomes (Porter, 1980).

The theory was used in this study to ascertain the degree to which record keeping can inform cost leadership, differentiation and focus among smallholder dairy farmers and the resultant business performance in terms of annual revenue in Kiambaa constituency. This study pursued the answer on how the several record keeping operations in terms of the type, method and frequency of record keeping as a farm operation activity can influence dairy farming business in Kiambaa Constituency of

Kiambu County in achieving cost leadership, differentiation or focus, and eventually revenue maximization as an aspect of dairy farming business performance.

2.3.3. Criticism of the theories

Profit maximization has been criticized of: ignoring time-value of money through failure to weigh between short term and long term considerations; ignoring risk and uncertainties by being simplistic and assuming a world of certainty; and being ambiguous due to generally accepted accounting principles that make the concept of economic and accounting profit ambiguous (Coffman, 1983). Despite the criticism, there is still a close link between value maximization and profit maximization which makes both theories applicable in business (Coffman, 1983).

Porters model operates on the assumption that a business is earning profits normally from demand for its products in a competitive environment, but does not take care of businesses in need of turnaround (Pretorius, 2008). The strategies also postulate differentiation and cost leadership strategies as equal paths towards outperforming competition yet differentiation based on superior quality is a more profitable strategy (Datta, 2010). The strategies are too broad and present a narrow view of differentiation with a unique, highly-priced commodity on one hand and a standard commodity on the other hand. In addition, it views differentiation and cost leadership as mutually exclusive in strategy formulation, yet they can work together. In fact, there is a suggestion that differentiation is the only strategy in the model because cost leadership is the same as price differentiation (Datta, 2010).

2.4. Empirical Literature Review

Several studies have already been undertaken in record keeping though with considerable departure points from the current study. A detailed presentation is contained in the subsequent subsections.

2.4.1. Type of records

Type of records refers to the various categories of capturing records based on their use. It addresses the question, ‘what records does a farmer choose to keep?’. Each type of record contains a combination of different pieces of data that form a single unit for a certain use.

Prajapati et al. (2015) study evaluated the status of record-keeping practices among farmers in India. Specifically, the study aimed to identify record-keeping practices among farmers in India, the benefits of these practices, and the determinants of record-keeping. Farming practices were analyzed using frequency analysis. Cross-tabulation technique was used to measure the determinants of record keeping and chi-square was used in empirical analysis. Mean and standard deviation were used to analyze the benefits of record-keeping. The constructs were measured using a Likert scale ranging from one (1) to five (5). The results revealed that the construct 'record-keeping helps in the determination of expenses and revenue' had a mean of 4.3. The difference with this study is the focus from general agriculture in India to the dairy subsector in Kenya.

Costa et al. (2012) survey of management practices that influence production and welfare of dairy cattle on family farms in southern Brazil assessed husbandry practices and environmental elements that affected animal welfare and productivity. The study compared extensive, pasture-based and semi-intensive farming systems. Chi-square and descriptive analysis were used in the study. This study's focused on record-keeping practices as a determinant of business performance in a local context.

Tham-Agyekum et al. (2010) conducted an assessment of farm record-keeping behavior among small-holder farmers in Ghana by considering Ga municipality. The study specifically purposed to establish the demographic factors that influence record-keeping among poultry farmers, the types of records kept by poultry farmers, and the benefits of record-keeping. The study used a random sample method to select 50 poultry farmer and used descriptive statistics and chi-square statistics for hypothesis testing. The point of departure is that it investigated behavior of poultry farmers in Ghana while this study focused on dairy context in Kenya and the influence of the records on their dairy farms' business performance.

Tebug et al. (2012) studied on-farm evaluation of dairy farming innovations uptake in northern Malawi aimed at identifying farm characteristics associated with adoption of common dairy innovations at farm level, as well as uptake of regular farm record-keeping. Data was collected using interviews, questionnaires, and visual inspection of records. Descriptive statistics were used for data analysis. That study investigated the

six (6) types of records which this study also investigated in a Kenyan context. This study employed questionnaires as the only tool of data collection.

Dudafa (2013) assessed the status of record keeping among the small farmers in Cross River State, Nigeria. The study assessed the scope of record keeping, the nature or type of records kept, the methods used to keep records, the reasons behind keeping records, problems faced in record keeping, and means of encouraging effective record keeping. Data was collected from crop, poultry, and livestock farmers using interviews. The study discovered that there wasn't uniformity in the type of records kept with most farmers keeping no records at all. This study investigated the status of record-keeping and the effect the practice had on performance in a local dairy set-up.

Mwanga et al. (2018) studied the factors influencing breeding decisions by smallholder dairy farmers in four (4) Sub-Saharan Africa (SSA) countries i.e. Ethiopia, Kenya, Tanzania, and Uganda. The study was to determine and characterize factors that influence the choice by smallholder farmers between bull service and AI for dairy cow breeding. The study investigated the relationships between the breeding choices and the bio-physical elements of dairy farming, mainly, farmer characteristics, among others. The study collected data on dairy smallholder farmers using cross-sectional survey through face-to-face interviews over a period of one (1) year. Multivariate logistic model was used to analyze the data. Recordkeeping was one of the farmer characteristics studied. The sites targeted in Kenya were in parts where land sizes were relatively large and the traditional socio-cultural behaviors favored grazing to stall feeding. This study focused on a Kenyan area where land sizes are relatively small and zero grazing is favored. Also this study was different as it collected data using questionnaires and analyzed it using Ordinary Least Squares (OLS).

Wairimu et al. (2011) studied the factors affecting the adoption of technical, organizational, and institutional dairy innovations in Mukurweini Wakulima Dairy Limited, Happy Cow Limited, and NKCC Sotik and analyzed data using the double hurdle model. This study was different as it focused on a different area, a different unit of analysis and different emphasis. Data analyses in this study was also done using OLS model.

Gichohi (2020) investigated the influence of record keeping and maintenance on decision-making among smallholder farmers in Gitugi ward, Murang'a County. The study applied a random sample selection criterion to select 175 dairy farmers. Structured questionnaires were administered to these farmers. The data collected was analyzed using the Ordinal Logistic Regression model. The study did not collect information about the kind of records kept, which was done by this study. The study also focused on decision-making as the independent variable while this study focused on farm business performance. Data analyses in this study was also done using OLS model

2.4.2. Methods of record keeping

Recordkeeping methods refer to '**how'** the records are maintained. This ranges from capturing, arranging, indexing, accessing, retrieving, and retaining them in a way that aids analysis and decision-making.

Prajapati et al. (2015) study that evaluated the status of record-keeping practices among farmers in India. Jeyabalan (2010) studied on Individual Cow Recording and Analysis System for Small Scale Dairy Farmers in Malaysia. Tham-Agyekum et al. (2010) assessed the farm record-keeping behavior among small-holder poultry farmers in Ghana. These studies assessed the construct of methods applied in record keeping which included either manual (hand) methods, electronic (computerized) methods or both. The current study focused on the same constructs but in a dairy Kenyan context.

Dudafa (2013) study assessed the status of record keeping among the small farmers in Cross River State, Nigeria. The study established the manner of recording which ranged from traditional to modern methods. This study focused on establishing the methods used by dairy farmers in a Kenyan context.

2.4.3. Frequency of record keeping

This refers to the rate at which farmers update their records. It refers to '**when or how often**' records are put down in writing or on a permanent form. The frequency can range from daily to annually.

Prajapati et al. (2015) study which evaluated the status of record-keeping practices among farmers in India revealed that most of the farmers updated their records daily. The study divided the frequency period into five (5) bands i.e. daily, once in two days, weekly, fortnightly and monthly. Tham-Agyekum et al. (2010) assessed the farm record-keeping behavior among small-holder poultry farmers in Ghana. That study classified frequency into daily, weekly and monthly categories. The frequency classifications in this study adapted the frequency constructs from these studies and assessed them in a dairy Kenyan context.

On the other hand, Dudafa (2013) assessed the status of record keeping among the small farmers in Cross River State, Nigeria. The study assessed the scope, types, methods, reasons and problems of record-keeping by crop, poultry and livestock farmers. The study did not asses how often farmers kept the records. Gichohi (2020) also investigated the influence of record keeping and maintenance on decision-making among smallholder dairy farmers in Gitugi ward, Murang'a County. The study did not collect information about the frequency of recording. These gaps were addressed by this study.

2.4.4. Record keeping and Business performance

Business performance refers to the ability of a business to live to its purpose using the resources applied. It is measured using different Key Performance Indicators (KPI) of achievement of desired goals.

Yeamkong et al. (2010) studied the effect of record keeping (among other factors) on monthly milk yield and revenue of dairy Farms in Central Thailand. The study used monthly milk yield and revenue as the KPI to measure performance. Costa et al. (2012) surveyed management practices that influence the production and welfare of dairy cattle on family farms in Southern Brazil. Milk production was used as a measure of performance. This study used milk revenue as the KPI to measure business performance.

Ergano & Nurfeta (2006) study on the economic performance of a dairy farm in Southern Ethiopia used different complementary research methods to collect data and Gross margin Analysis to analyze the farm performance. Similarly, Wambugu et al.

(2011) used Gross margin (total income less total variable costs) to analyze performance in the study on the productivity trends and performance of dairy farming in Kenya. The study was conducted using nationwide representative panel household data collected in the major milk-producing areas i.e. Trans Nzoia, Kinangop, Nyeri, Githunguri, and Kericho. This study is different in that it focused on many smallholder farmers and used annual milk revenue instead of gross margin (total revenue less total expenses) as a measure of performance.

2.5.Gaps in literature review

Table 2.1. Gaps in literature review

Record-keeping practices				
Author and Year	**Title**	**Findings and Variables relating to the study**	**Research Methodology**	**Research Gap**
(Prajapati et al., 2015)	A study on the status of farm record-keeping practices among farmers in Anand Taluka, India	Most farmers prepare crop budgets records, some prepare expenses and revenue records while a few maintain financial records.	Descriptive statistics and chi-square	• Focus was on general agriculture in an Indian economy. The findings may not be applicable in Kenyan.
(Yeamkong et al., 2010)	Effect of Experience, Education, Record Keeping, Labor and Decision Making on Monthly Milk Yield and Revenue of Dairy Farms Supported by a Private Organization in Central Thailand.	Record keeping had a significant impact on milk production and revenue per farm but not per cow in the farms that kept records.	Mixed linear mode	• This study used descriptive statistics and OLS. • Types of records analyzed expanded beyond milk production and pedigree information.
(Costa et al., 2012)	Management practices that influence production and welfare of dairy	Lack of farm records was a prevalent issue that prevented farmers from	Descriptive analysis and Chi-square	• Focused on general management practices and not specifically

	cattle on family farms in southern Brazil	accurately assessing the occurrence of diseases in their herds and limited their awareness of farm problems.		recordkeeping practices.
(Tham-Agyekum et al., 2010	Assessing farm record keeping behavior among Small-scale poultry farmers in the Ga East Municipality country.	All farmers kept production and financial records, most kept health while a few kept supplementary records.	Descriptive statistics and chi-square	• Focused on small-scale poultry farmers in Ghana while this study focused on dairy farmers in Kenya.
(Tebug et al., 2012)	On-farm evaluation of dairy farming innovations uptake in northern Malawi	There was predominantly low number of records kept, a lack of interest and a failure to perceive the need for farm records among the farmers	Descriptive statistics	• Except for production, milk sales, and feeding records, other records assessed differ from those in this study. • The area of study was Northern Malawi, unlike this study that focuses on Kenya.
(Dudafa, 2013)	Status of record keeping among the small farmers in Cross River State, Nigeria	There was no uniformity in the type of records kept with most farmers keeping no records.	Descriptive statistics	Study based on regional context and general agriculture, while this study focused on the dairy sector in a local context.
(Mwanga et al., 2018)	Factors influencing breeding decisions by smallholder dairy farmers in four (4) Sub-Saharan Africa (SSA)	Predominantly kept records were animal breeding, health, calving dates, and milk yield records. The majority of farmers did not keep critical farm performance records such as production, sales, farm expenses, and animal feeding.	Multivariate logistic model	• Analysis was done using multivariate logistic model while this study used OLS model. • Kenyan sites targeted were where land sizes were large and the grazing was favored.
(Kimunya, 2014)	Effects of patterns of	67% of farmers kept animal health	Descriptive statistics.	This study expands the scope of records kept.

	adoption of dairy farming technologies among small-scale farmers in Githunguri Division, Kiambu County	records while 32% did not keep any records. The records were adopted as a technology for monitoring health and reducing the cost of dairy farming.		
(Gichohi, 2020)	Role of record keeping in decision-making	The kind of decisions made based on dairy farm records statistically and significantly affect output in dairy farming businesses.	Ordinal logistic regression analysis	• Data analysis was done using ordinal logistic regression while this study used OLS model. • The study focused on the role of record-keeping in decision-making as opposed to performance. • The study did not collect information about the kind of records kept. • The area of focus was Murangá County while this study focuses on Kiambu County.
Methods of record keeping				
(Prajapati et al., 2015)	A study on the status of farm record-keeping practices among farmers in Anand Taluka, India	100% of the farmers kept records manually.	Descriptive statistics and chi-square	• The study focused on general agriculture and was not specific to dairy farming. • The location was in an Indian economy while this study focuses on an area under the Kenyan economy.
(Tham-Agyekum et al., 2010	Assessing farm record keeping behavior among Small-scale poultry farmers in the Ga East Municipality, Ghana.	Most (82%) of farmers kept manual records for their poultry, 2% had automated records and 16% used a hybrid of manual and	Descriptive statistics and chi-square	The study focused on poultry farmers in Ghana while the current study focusses on dairy farmers in Kenya.

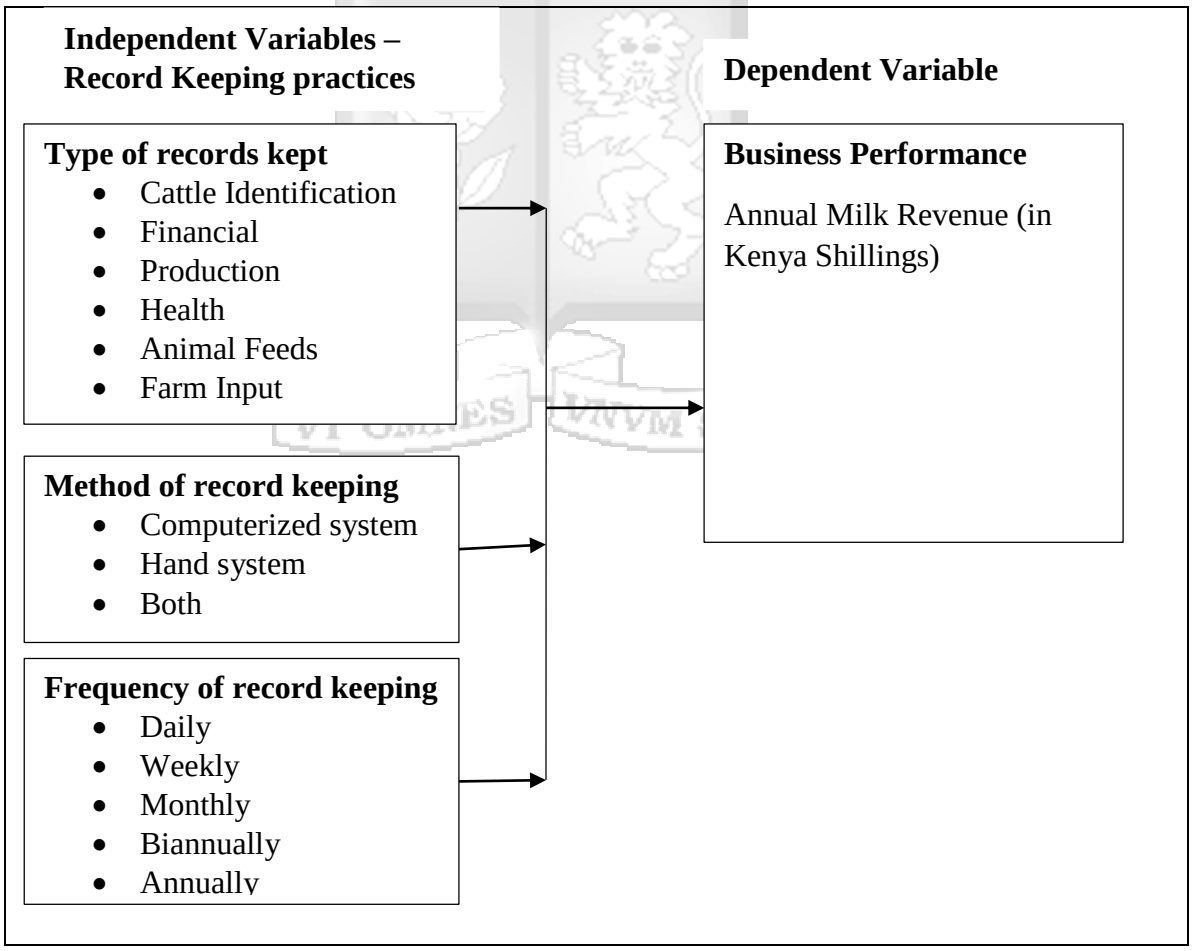
		automated methods.		
(Dudafa, 2013)	Status of record keeping among the small farmers in Cross River state, Nigeria.	The manner of recording ranged from traditional to modern though most applied the manual nature of recording.	Descriptive statistics	• The study established different manual methods of recording with no reference to automation. This study's focus is on either manual or automation or both. • This study's is based on a local context in dairy farming only.
Frequency of record keeping				
(Tham-Agyekum et al., 2010)	Assessing farm record keeping behavior among Small-scale poultry farmers in the Ga East Municipality, Ghana.	62% of farmers kept their records daily, 30% weekly, and 8% monthly.	Descriptive statistics and chi-square	The study focused on poultry farmers in an international context which may not be applicable in a local dairy sector context.
(Prajapati et al., 2015)	A study on the status of farm record-keeping practices among farmers in Anand Taluka, India.	56% maintained records daily, 8% every two days, 21% weekly, monthly, 6% fortnightly, and 8% monthly.	Descriptive statistics and chi-square	The study findings may not be applicable in a local dairy context as it was based on an international general agriculture context.
(Dudafa, 2013)	Status of record keeping among the small farmers in Cross River State, Nigeria	While some recordings were systematic and regular, others were irregular and desultory.	Descriptive statistics	The study did not collect information on frequency of recording. This study filled the gap.
(Gichohi, 2020)	Role of record-keeping and maintenance in enhancing decision-making among smallholder dairy farmers in Murang'a.	The kind of decisions made based on dairy farm records statistically and significantly affect output in dairy farming businesses.	Ordinal logistic regression analysis	The study did not collect information about the kind of records kept, a gap that will be filled by this study.

Record keeping and Business performance				
(Yeamkong et al., 2010)	Effect of Experience, Education, Record Keeping, Labor, and Decision Making on Monthly Milk Yield and Revenue of Dairy Farms Supported by a Private Organization in Central Thailand.	Record keeping had a significant impact on milk production and revenue per farm in the farms that kept records.	Mixed linear model	The independent variable was measured as total revenue from milk sold per month, while this study's independent variable is annual milk revenue.
(Ergano & Nurfeta, 2006**)**	Study on economic performance of a dairy farm in Southern Ethiopia.	The dismal performance of a farm can be attributed to the lack of a well-organized record system among other factors.	Gross Margin Analysis (gross revenue less variable costs)	• Performance was based on gross profit while this study measured performance based on annual milk revenue. • This was a case study for one farm in Ethiopia, while the current study focuses on a group of smallholder farmers in Kenya.
(Costa et al., 2012)	Management practices that influence production and welfare of dairy cattle on family farms in southern Brazil	Lack of farm records was a prevalent issue that prevented farmers from accurately assessing the occurrence of diseases in their herds and limited their awareness of farm problems.	Descriptive analysis Chi-square	Performance was measured in terms of liters of milk sold. This study measures performance based on annual milk revenue.

2.6. Conceptual Framework

This is a pictorial illustration of the constructs used in a study and how they interact with each other to answer the study questions. This study conceptualizes that recordkeeping practices affect dairy farming business performance. In light of this, recordkeeping practices have been divided into three main categories namely: the type of records kept, the methods used in keeping records, and the frequency of recordkeeping as informed by previous empirical studies. These variables constitute the independent variables and are regressed against the dependent variable which is measured in terms of annual milk revenue. The variables to be used in the study are presented in the conceptual framework, the left hand side display the independent variables while the right-hand side present the dependent variable. The conceptual framework is displayed in Figure 1.1.

Figure 1.1: Conceptual framework on record-keeping practices



Source: Researcher 2023

2.7.Operationalization of Variables

In this study, the dependent variable was farm business performance whereas the independent variables were; the type of records kept (cattle identification, financial, production, health, animal feeds, and farm inputs records), method of record keeping (computerized, manual or both) and frequency of record keeping (annually, bi-annually, monthly, weekly and daily). The variables and constructs were chosen based on suggestions by past empirical and theoretical studies and were measured to enable the collection of data for use in both descriptive and inferential statistics.

Table 2.3. Operationalization of variables on record-keeping practices

Variable	Construct	Operational definition	Measurement	Source
Type of records keeping	• Cattle identification records • Financial records • Production records • Health Records • Animal feed records • Farm input records	The specific type of record kept.	5 – Point Likert Scale (1 Strongly disagree, 2 Disagree, 3 Somewhat agree, 4 Agree, 5 Strongly agree)	Yadeta et al., 2020; Dudafa, 2013; Prajapati et al., 2015; Tham-Agyekum et al., 2010; Tebug et al., 2012; Mwanga et al., 2018
Method of record keeping	• Automated /computerized system • Manual/hand system	Form of recording	5 – Point Likert Scale (1 Strongly disagree, 2 Disagree, 3 Somewhat agree, 4 Agree, 5 Strongly agree)	Moran & Chamberlin, 2017; Yadeta et al., 2020
Frequency of record keeping	• Annually • Bi-annually • Monthly • Weekly • Dairy	The rate of updating dairy farming records	5 – Point Likert Scale (1 Strongly disagree, 2 Disagree, 3 Somewhat agree, 4 Agree, 5 Strongly agree)	Jeyabalan, 2010; Tham-Agyekum et al., 2010; Prajapati et al., 2015
Farm performance	• Milk revenue	Annual milk revenue in	Ratio Scale	Moran, 2009; Moran & Chamberlin, 2017

		Kenya Shillings		

2.8.Summary of the Literature Review

Literature precisely relative to record-keeping practices by dairy farmers in Kiambaa constituency was non-existent. The literature that was closest to this study was the one conducted by Prajapati et al. (2015) in India but with a focus on general agriculture. In Kenya, a similar study by Gichohi (2020) focused on the influence of recordkeeping and maintenance on decision-making among smallholder farmers in Gitugi ward, Murang'a County. Moreover, there was no evidence of examinations of the nexus between recordkeeping practices and dairy farm business performance in Kenya. Therefore, the strength of this study was in its uniqueness in Kenya and in filling the gaps left by previous local studies.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Introduction

This chapter illustrates the systems of methods that aided the study in achieving its objectives. The chapter begins by underlining the research philosophy as well as the rationale behind its adoption. It goes ahead to mention the design, study area, population, and sample calculation. Further, the chapter explains the data collection procedure and techniques for analysis.

3.2. Research Philosophy

Research philosophy refers to the development of research assumptions, knowledge, and nature. It is a belief about how research data should be collected, scrutinized, and applied. The different research philosophies embrace epistemology (what is known to be true) as opposed to doxology (what is believed to be true). Science therefore aims at transforming beliefs into knowledge (Žukauskas et al., 2018). There are four (4) major research philosophies in business and management; positivism, interpretivism, pragmatism, and realism. The four philosophies aim to explain methodological differences in research (Žukauskas et al., 2018).

This study was based on positivism philosophy which claims that the social world can be understood in an unbiased way majorly using quantitative methods (Žukauskas et al., 2018). It is characterized discovery of objective, evidence-based truth through well-described experimentation (Park et al., 2020). The philosophy propagates that the researcher disassociates her personal interests and conducts the research objectively and independently. This philosophy is mostly associated with observations and experiments and is applicable where collection of numerical data is involved (Žukauskas et al., 2018) and functional relationships can be derived between dependent and independent variables. (Park et al., 2020).

This study was based on objective reality as given through responses by the respondents on recordkeeping practices and farm performance. All other factors were isolated in order to study only key variables in the study. The knowledge was developed without the researcher's influence to illustrate the causal relationship between the dependent and the independent variables. Empirical results were obtained

using quantitative methods of inquiry. Thus, the study was underpinned by positivist research philosophy.

3.3. Research Design

Research design is a framework that represents a roadmap for research right from the planning stage to the dissemination stage. It helps the researcher reflect beforehand on how research questions will be answered, and how the data will be collected, analyzed, and interpreted. This study used a descriptive case study research design in the investigation of the effect of recordkeeping practices on dairy farming business performance in Kiambaa Constituency.

As asserted by Kothari (2004), this study chose a descriptive case study research design as it offers a description of the phenomenon and features of study subjects to establish cause and effect. The design supports the use of surveys/questionnaires to gather data and can combine several analytical techniques as well as methods and presentations like tables, charts, and graphs. The design also allows for the investigation of relationships between variables without the researcher controlling or manipulating any of them. This made it suitable for this research.

3.4. Study Population

The study was conducted in Kiambaa constituency which is within Kiambu county. Kiambu is the leading county in milk production in Kenya (Kenya news agency, 2021). The county has a sub-urban setting and neighbors the capital city of Kenya, Nairobi. It therefore supplies a significant production of its milk to the city while also having a big local market. In addition, it also sells milk to other processors and private institutions (Simbe, 2012).

The population selected was drawn from members of the Kiambaa Dairy Farmers Co-operative Society (KDFCS) which is within Kiambu County. The choice of this area was because smallholder dairy zero-grazing is widely practiced in the area as necessitated by high population growth, diminishing farm sizes, increased demand for milk, and improved milk prices (Simbe, 2012). A list of members of the cooperative society was obtained from Kiambaa Dairy Farmers' Cooperative Society (KDFCS). The society had a membership of 4,800 dairy farmers.

3.5.Sampling design

The study used random sample process to select the farmers. Random sampling is a useful criterion in situations where the study participants do not have similar characteristics (Kothari, 2004). The dairy farmers are quite diverse in terms of their demographics; some may be male and others are female, some part-timers and others full-timers amongst other differences. It is for this reason that random sampling is a viable selection criterion for the study. The sample size of the study was 400 farmers drawn from Kiambaa Dairy Farmers Cooperative Society (KDFCS). A sample of 369 farmers was arrived at using the Yaro Yamane (1967) formula, and an additional thirty-one (31) were added to take care of non-responsive respondents. The formula and workings are shown in equations 3.1 and 3.2 respectively.

$$n = \frac{N}{K+N(e)^2} \quad \text{.....3.1}$$

Where:

N=Study population

n =sample size

e=sampling error

K=constant

$$369 = \frac{4800}{1+4800(0.05)^2} \quad \text{.....3.2}$$

3.6.Sampling technique

The selection of farmers was spread across the different milk collection route areas covered by Kiambaa Dairy Farmers Co-operative Society (KDFCS). The focus was smallholder farmers with a minimum of one (1) and a maximum of five (5) cows who sold their milk to KDFCS. The route areas and population of farmers per route was provided by the management of KDFCS during a meeting. A random selection of proportional farmers per route was then done to make a sample size of 400 farmers.

Table 2.4: Sample frame

Route/Area	Population of farmers	percentage of population of farmers	Sample size	Percentage of the sample
Kanunga, Laini, Kawaida, Waguthu	587	12%	50	13%
Ndenderu, Gacharage, Karura Ka Nyungu, Gachie, Kihara, Gathanga, Ruaka	954	20%	80	20%
Munyaka, Karura Ka Murimu, Kirienye, Kianjogu, Kimulea, Kabuku, Redhill	1367	28%	110	28%
Kamucege 1	397	8%	35	9%
Kamucege 2	473	10%	40	10%
Kamucege 3	360	8%	30	8%
Kamucege 4	416	9%	35	9%
Kamucege 5	246	5%	20	5%
TOTAL	**4,800**	**100**	**400**	**100%**

3.7. Data Collection Procedure and Instruments

3.7.1. Data collection instrument

Data was collected by use of structured questionnaire. The design was adapted from past empirical and theoretical reviews. The independent variables were informed by various record-keeping practices as depicted by past empirical studies on recordkeeping practices. The dependent variable was informed by porter's generic strategies and profit maximization and competition-based theory which postulate that a business aims to maximize profits and therefore have to employ certain strategies in order to achieve this goal. The questionnaire was designed by the researcher in English language which is offered as a compulsory subject in the Kenyan education system at both primary school and secondary school levels. Kiambu County had a school enrollment rate of 72%, and a retention and transition rate of 95% (County Government of Kiambu, 2018). Consequently, most of the respondents could comprehend English, thus the choice of the language.

The questions in the questionnaire facilitated collection of quantitative data to answer the research questions and help determine the relationship between record-keeping

practices and farm business performance. They were arranged thematically beginning with demographic information, followed by business performance i.e. annual milk revenue, and then record-keeping practices i.e. the various types, methods, and frequencies of record-keeping. All the questions were close-ended. The completion of the questionnaires was accomplished through one-on-one interviews.

3.7.2. Data collection procedure

The procedure started by the researcher training the research assistants on research etiquette, time management, and basic communication. She also scheduled a meeting concerning the study with KDFCS management. In the meeting, the researcher obtained the route areas of milk collection and population of farmers per route. The researcher asked the management to notify the randomly selected 400 smallholder farmers about the study and plan dates of interviews with them. Calls were made to the notified farmers before the visits, and availability and the time of the visit were confirmed. 10 research assistants were engaged in the data collection exercise and an official in KDFCS assisted in taking them to the farmers' houses. Each research assistant visited 8 farmers each day to accomplish the task within 5 working days.

The questionnaires were administered using personal interviews. Each interview was allocated 30 minutes within which the research assistants introduced themselves to the interviewee, explained the purpose of the research, provided materials necessary for the respondents to comply with the survey, and collected the data as per the questionnaire. The entries in the study tool were indexed and captured in the Statistical Package for Social Sciences (SPSS) program, where they were cleaned and analyzed.

3.8. Data Analysis

The study used quantitative methods of data analysis. Statistical Package for Social Sciences (SPSS) software version 29 was used to analyze the data. Confirmatory factor analysis, correlation analysis, and Ordinary Least Squares (OLS) regression method modeled the association between the outcome variable (Y) and the predictor variables i.e. type of records kept (X1), method of record keeping (X2) and frequency of record keeping (X3). This method was suitable for modeling a relationship because there was a collection of independent variables and is suitable for modeling binary, continuous, ordinal, and categorical variables (Pohlmann et al., 2003). Data presentation was done

using frequencies, percentages, means, standard deviation, and estimation coefficients. This was augmented by offering a narrative interpretation of the results.

Confirmatory factor analysis was done to determine the factors and factor loadings of the sub-variables associated with the predictor variables. Principle component analysis rotated through the varimax method with Kaiser Normalization used to extract components. The main objective of the confirmatory factor analysis was to reduce the multiple predictor sub-variables as indicated in the literature review to justify the use of the three predictor variables: type of record kept, method of record keeping, and frequency of record keeping. Correlation analysis was done to establish the level of correlation between the dependent and independent variables to ascertain their suitability for further data analysis. Regression analysis was used to describe the relationship between on outcome variable (**Y**) and the predictor variables: type of record kept (**X1**); method of record keeping (**X2**); and frequency of record keeping (**X3**). Equation one (1) is the expression of the ordinary least square regression model.

Equation one (1) on the effects of type of records kept on business performance

$Y = \beta 01 + \beta_1 X_1 + \beta 2 X2 + \beta_3 X_3 + \varepsilon_1$

Where:

Y - the dependent variable - business performance

$\beta 0_1$ - constant

β_1 - regression coefficients for the type of records kept

$\beta 2$ - regression coefficients for the method of record keeping

β_3 - regression coefficients for the frequency of record-keeping

X_1 - column vectors for the type of records kept

$X2$ - column vectors for the method of record-keeping

X_3 - column vectors for the frequency of record-keeping

ε_1 - Error term

ANOVA table output results were used to ascertain the existence of a significant relationship between the outcome and predictor variables.

3.9.Research Quality

Validity and reliability are the two most fundamental features of any research measurement instrument. They concern the trustworthiness of the data collected to make good decisions. Validity is the ability of a research tool to capture and measure its objective. Reliability is the confidence a researcher has in results gotten using the research tool and its ability in controlling random errors (Mohajan, 2017). It is crucial to carry out validity and reliability tests to guarantee robustness and confidence in the data collected (Kothari, 2004).

3.9.1. Validity

To ascertain validity, content and construct validity approaches were used. Content validity evaluates questions in the research instrument to determine whether they successfully address the study questions. On the other hand, construct validity gauges the extent to which a test measures the existence of the concept the study planned to evaluate (Saunders et al., 2009). Content validity was undertaken through empirical review in order to formulate questions for the questionnaire. The questionnaire was also reviewed by the supervisor. Construct validity was accomplished through evaluation of responses from different respondents in a mock study. This allowed for clarifications to be made with the research assistants before actual data collection.

3.9.2. Reliability

Mahajan (2017) defines reliability as the ability of data collection tools to be replicated in the future. It is a measure of consistency, trustworthiness, repeatability, and precision of a research tool. The reliability coefficient lies between zero (0) which signifies no reliability and one (1) which signifies perfect reliability. Values above 0.7 signify acceptable reliability. A mock study was conducted among 30 farmers outside the sample population. Data from different research assistants were analyzed for 'inter-rater reliability' to determine the coefficient of agreement from the independent research assistants. Cronbach's (1951) alpha (α) was used as a measure of consistency.

Table 3.11: Reliability tests

Variable	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of items

Type of Record Kept	.790	.800	6
Method of Record Keeping	.703	.773	3
Frequency of Record Keeping	.716	.706	5

Source: Research Data 2024

Table 3.2: Overall reliability tests

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
.761	.788	14

Source: Researcher Data 2024

3.9.3. Diagnostic test

3.9.3.1. Multicollinearity tests

Multicollinearity is a violation that occurs when the independent variables are highly correlated in a regression model. The high correlation amongst the variables would lead to incorrect interpretation of relationships between independent and dependent variables, or impossible regression in cases of perfect correlation (Daoud, 2017). To detect multicollinearity, the study used the Variance Inflation Factors (VIF) tool which measures and quantifies the extent to which the variances are correlated. VIF of one (1) indicates that the variables are not correlated, between one (1) and (5) is an indication of moderate correlation, while greater than five (5) is an indication of high correlation. Therefore, there was no correlation between the variables as evidenced by the variance inflation factors in the table below.

Table 3.3 Multicollinearity test results

Model	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	1.220	.022		58.852	.000		

Type of Records Kept	.127	.022	.306	5.818	.000	.908	1.102
Method of Record Keeping	.043	.022	.104	2.049	.041	.980	1.020
Frequency of Record Keeping	.155	.022	.374	7.122	.000	.909	1.100

Source: Researcher Data 2024

3.9.3.2. Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy

This measures the sufficiency for each variable sampled as well as for the whole model. It is a pre-requisite for factor analysis which helps in determining the variables that are relatively independent of one another in a study (Shrestha, 2021). If the KMO value computed is less than 0.5, remedial action should be taken as this will be an indication of inadequate sampling. Considering Bartlett's test value of (1283.392; $p < 0.000$) and KMO value (0.638) obtained to test the divisibility of the correlation matrix into factors, the data was determined to be suitable for factor analysis.

Table 3.4 KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.638
Bartlett's Test of Sphericity	Approx. Chi-Square	1283.392
	df	91
	Sig.	.000

Source: Researcher Data 2024

3.10. Ethical Consideration

The study placed much emphasis on ethical concerns in research and ensured that it did not violate it at any stage. Firstly, during the drafting of the proposal, originality was observed to produce a document that was unique and without plagiarism. Secondly, before data collection the researcher obtained clearance from the ethics board. In addition, research permits were granted from Strathmore university, National Commission for Science, Technology and Innovation (NACOSTI) and Kiambaa Dairy Farmers Cooperative Society (KDFCS). Finally, during data collection, informed

consent was issued to the study participants and they were dully signed to ensure that no one was coerced into giving responses. In addition, the respondents were adequately informed about the aim of the research, and information confidentiality was guaranteed.

3.11. Research Methodology Summary

The chapter details the research methodology used in the study of the effects of record-keeping practices on dairy farm business performance. It describes the sampling methodology, the instrument as well as the procedure for data collection. The chapter also provides a detailed explanation of the data analysis techniques used, quality, and ethical issues considered.

CHAPTER FOUR: PRESENTATION OF RESEARCH FINDINGS

4.1. Introduction

This chapter analyses the data collected using the methodology proposed in the previous chapter. It is divided into introduction, the return rate, demographic information, descriptive statistics and inferential statistics sections as shown in the conceptual framework.

4.2. Response rate

The questionnaire response rate was 83% as shown in table 4.1 below.

Table 4. 1: Response rate

Sample size	Responded	Response rate (%)
400	332	83%

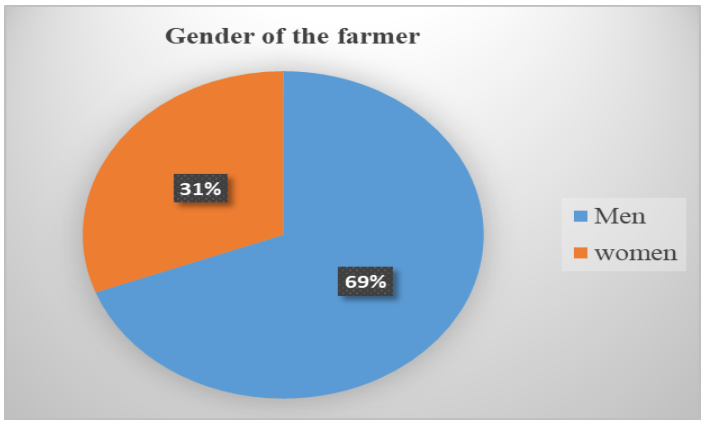
Source: Researcher Data 2024

The response rate was adequate as it surpassed the average rate of 30% for 'delivery and collection' questionnaires (Saunders et al., 2009). This implied that the quality of the questionnaire was acceptable. The main reasons for non-response were lack of authorization from owners where farms were managed by farmhands; taxation paranoia; and fear by respondents who side-sold milk outside the co-operative society.

4.3. Demographic Information

The study established that 31 percent (102) of the interviewees were women and 69 percent (230) were men. These findings indicated that most smallholder dairy farms in Kiambaa constituency are owned by men. This imply that most smallholder dairy farming households are headed by men who are the custodian of the household resources including the dairy farming businesses.

Figure 4.1 Gender of the farmer



Source: Researcher Data 2024

4.4 Descriptive Statistics

This section details the descriptive statistics relating to both the outcome variable and predictor variables. The independent variables (type, method and frequency of record keeping) are presented first followed by the dependent variable (farm business performance).

4.4.1 Type of Records Kept, Method of Record Keeping, and Frequency of Record Keeping

The descriptive study outcome on the type of record kept, method of recordkeeping, and frequency of recordkeeping on the level of agreement or disagreement on statements on their effects on dairy farming business performance in Kiambaa constituency varied as evidenced by the means and standard deviations. The level of agreement or disagreement was analyzed on a five (5) point Likert scale where 1 was strongly disagree, 2 disagree, 3 somewhat agree, 4 agree, and 5 strongly agree.

4.4.1.1. Type of Record Kept

The respondents somewhat agreed with the statements on the type of records kept as evidenced by the overall mean score of 3.26 and a standard deviation of 1.014. The respondents agreed to the statement that they keep health records for their dairy businesses giving the highest mean score of 3.77 and a standard deviation of 0.974. However, they somewhat agreed with the statement that they keep farm input records for their dairy businesses giving the lowest mean score of 2.59 and a standard deviation of 1.099.

Table 4.2 Type of Record Kept

Statement on type of record kept	Mean	Std. Deviation
I keep health records for my dairy business.	3.77	0.974
I keep production records for my dairy business.	3.56	0.900
I keep financial records for my dairy business.	3.48	0.911
I keep animal feeds record for my dairy business	3.20	0.998
I keep cattle identification records for my dairy business.	2.97	1.204
I keep farm input records for my dairy business	2.59	1.099
	3.26	**1.014**

N = 332

Source: Researcher Data 2024

4.4.1.2. Method of Record Keeping

The respondents disagree with the statements on methods of record keeping as evidenced by a return of an overall mean of 2.38 and a standard deviation of 1.216. The respondents somewhat agreed with the statement that they use hand system/manual methods to record dairy farm data giving the highest mean score of 3.07 and a standard deviation of 1.156. However, the respondents disagreed with the statement that they use both computer/automated and hand/manual systems to record their farm data giving the lowest mean score of 1.88 and a standard variation of 1.250.

Table 4.3 Method of Record-Keeping

Statement on methods of record keeping	Mean	Std. Deviation
I use hand system/manual methods to record dairy farm data.	3.07	1.156
I use computer/automated methods to record my dairy farm data.	2.21	1.242
I use both computer/automated and hand/manual systems to record my dairy farm data	1.88	1.250
	2.38	**1.216**

N = 332

Source: Researcher Data 2024

4.4.1.3. Frequency of Record Keeping

The frequency of record keeping returned an overall mean score of 2.25 and a standard deviation of 1.254 indicating that on average, the respondents disagreed with the statements on the frequency of record keeping. The respondents somewhat agreed with the statement that they update their data daily (every day), giving the highest mean score of 2.94 and a standard deviation of 1.482. The respondents disagreed with the statement that they update their data biannually (once every six months) giving the lowest mean score of 1.63 and a standard deviation of 0.988 under the frequency of record-keeping variable.

Table 4.4 Frequency of Record Keeping

Statement on frequency of record keeping	Mean	Std. Deviation
I update my data daily (every day)	2.94	1.482
I update my data monthly (once every month)	2.72	1.297
I update my data weekly (once every week)	2.11	1.319
I update my data yearly (once in a year)	1.84	1.184
I update my data biannually (once every six months)	1.63	0.988
	2.25	**1.254**

N = 332

Source: Researcher Data 2024

4.4.2. Dairy Farming Business Performance

Dairy farming business performance in Kiambu County with specific reference to the Kiambaa constituency was the outcome variable in the study. The variable was measured in terms of the annual milk revenue in Kenya shillings. The amount was measured in ranges of < 250,000, 250,000 – 500,000, 500,001 – 750,000, and > 750,000.

Table 4.5 Business performance

Annual Milk Revenue in Kes.	Frequency	Percent
< 250,000	259	78.0
250,000 - 500,000	73	22.0
500,001 - 750,000	0	0.0
750,001 >	0	0.0
Total	**332**	**100.0**

N = 332

Source: Researcher Data 2024

A total of 259 respondents (78%) earned below Kes. 250,000 annual milk income and 73 respondents (22%) earned between Kes. 250,000 – 500,000 annual milk income.

4.5. Inferential Statistics

The study was conducted to establish the effects of the type of record kept, method of recordkeeping, and frequency of recordkeeping on dairy farming business performance in Kiambu County with specific reference to the Kiambaa constituency. The study adopted inferential analysis - Confirmatory factor analysis, correlation analysis, and regression analysis to determine the relationship between the predictor variables and outcome variables.

4.5.1. Factor Analysis

The study had fourteen sub-variables aligned to the three independent variables as informed by the literature review. Confirmatory factor analysis was done to confirm the factors and factor loadings of the sub-variables under the independent variables as was obtained from the literature review. The rotation converged at three iterations resulting in three factors that explained 67.455% of the total initial eigenvalues percentage variance in the independent variables. Type of record kept accounted for 32.721% of the variance, method of record keeping accounted for 18.311% of the variance while frequency of record keeping accounted for 16.423% of the variance.

The sub-variables were confirmed to align with the independent variables. However, the sub-variable related to the use of computer/automated and hand/manual systems to record dairy data was removed under the method of record keeping while weekly

update of data (once every week) was removed under the frequency of record keeping due to low factor loadings. The resultant auto-generated factors were used as independent variables in the study as the type of record kept, method of record keeping, and frequency of record keeping for the correlation and regression analysis.

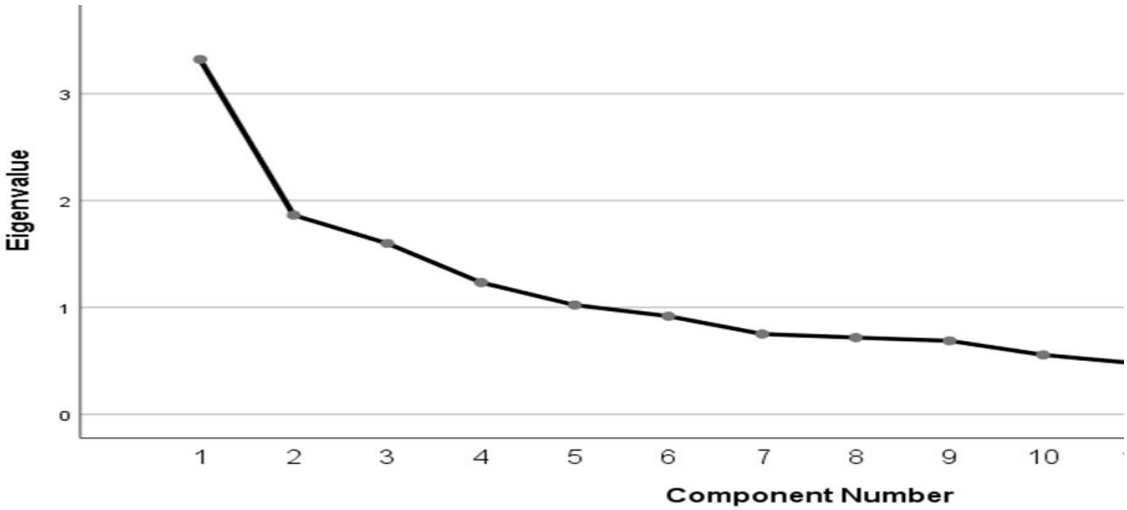
Table 4.6 Rotated Component Matrix

Sub-Variables	**Component**		
	1	2	3
I keep financial records for my dairy business.	**0.827**		
I keep production records for my dairy business.	**0.759**		
I keep animal feeds record for my dairy business	**0.718**		
I keep cattle identification records for my dairy business.	**0.670**		
I keep health records for my dairy business.	**0.646**		
I keep farm input records for my dairy business	**0.567**		
I use computer/automated methods to record my dairy farm data.		**0.928**	
I use hand system/manual methods to record dairy farm data.		**0.913**	
I use both computer/automated and hand/manual systems to record my dairy farm data		0.262	
I update my data daily (every day)			**0.806**
I update my data monthly (once every month)			**0.764**
I update my data yearly (once in a year)			**0.669**
I update my data biannually (once every six months)			**0.536**
I update my data weekly (once every week)			0.034

Source: Researcher Data 2024

Scree Plot

Figure 4.2 Scree Plot



Source Research Data 2024

4.5.2. Correlation Analysis

The correlation outcome showed that there was a statistically significant relationship between the independent variables and dependent variables. The results indicated that the type of record kept had the strongest relationship with the dairy farming business performance (r = .330, p = 0.000) followed by the method of record keeping (r = .244, p = 0.000) and then the frequency of record keeping (r = .204, p = 0.001). Therefore, the correlation test between the predictor variables and outcome variables showed enough correlation to justify regression analysis.

Table 4.7: Correlation Matrix

Dependent Variable		**Independent Variables**			
		Type of Record Kept	**Method of Record Keeping**	**Frequency of Record Keeping**	**Annual Milk Revenue in KES**
Annual Milk Revenue in KES	Spearman's rho Correlation	.330**	.244**	.204**	1.000
	Sig. (2-tailed)	0.000	0.000	0.000	
	N	332	332	332	332

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Researcher Data 2024

4.5.3. Regression Analysis

The regression analysis was carried out to explore the extent to which the dependent variable could be explained by the independent variables in the examinations of the effect of recordkeeping practices on dairy farming business performance in Kiambaa constituency. Multiple regression analysis was used in the study to describe the relationship between one dependent variable and three independent variables.

The coefficient of determination R^2 in the linear regression model was 0.178. This implies that 17.8% of the variance in dairy farming business performance (dependent variable) can be explained by the type of record kept, frequency of record keeping, and method of record keeping (independent variables). Therefore, the regression summary indicated that the type of record kept, method of record keeping, and frequency of record keeping by dairy farmers have an effect on dairy farming business performance in Kiambu County with specific reference to Kiambaa Constituency.

Table 4.8. Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.422[a]	0.178	0.171	0.378

a. Predictors: (Constants) type of record kept, frequency of record keeping, method of record keeping

Source: Researcher Data 2024

The ANOVA table below shows that the type of record keeping, method of record keeping, and frequency of record keeping (independent variables) statistically and significantly predicted dairy farming business performance (dependent variable), $F = 23.745$, $p < 0.000$. This indicated that a significant relationship existed between the dependent variable and the independent variable and that the regression model was a good fit for the data.

Table 4.9. Analysis of Variance (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.161	3	3.387	23.745	.000[b]
	Residual	46.787	328	0.143		
	Total	56.949	331			

a. Dependent Variable: Annual Milk Revenue in KES

b. Predictors: (Constant), type of record kept, frequency of record keeping, and method of record keeping

Source: Researcher Data 2024

Linear regression results; t = 58.852, β = 1.220 (standardized coefficient), p<0.000. This indicated that the dependent variable (dairy farming business performance) and the independent variable (type of record kept, method of recordkeeping, and frequency of recordkeeping) could be fitted in the linear regression model adopted by the study. The model was:

$$Y = \beta 01 + \beta_1 X_1 + \beta 2 X 2 + \beta_3 X_3 + \varepsilon_1$$

Where:

Y - the dependent variable - business performance

$\beta 0_1$ - constant

β_1 - regression coefficients for the type of records kept

β_2 - regression coefficients for the method of record keeping

β_3 - regression coefficients for the frequency of record-keeping

X_1 - column vectors for the type of records kept

X_2 - column vectors for the method of record-keeping

X_3 - column vectors for the frequency of record-keeping

ε_1 - Error term

The linear regression model using the standardized coefficient was;

Business performance = 1.220 + 0.306 (type of record kept) + 0.104 (method of record keeping) + 0.374 (frequency of record keeping) + 0.022 (standard error).

The study results indicated that the type of record kept, frequency of recordkeeping, and method of recordkeeping had a marginal positive and statistically significant effect

on dairy farming business performance whereby for every unit change in the aspects of the different farm records kept, method of record keeping and frequency of record keeping the rate of dairy farming business performance would be positively affected by 0.306 units, 0.104 and 0.374 units respectively using the standardized coefficient.

Table 4.10 Regression Coefficient Model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.220	0.022		58.852	0.000
	Type of record kept	0.127	0.022	0.306	5.818	0.000
	Methods of record keeping	0.043	0.022	0.104	2.049	0.041
	Frequencies of record keeping	0.155	0.022	0.374	7.122	0.000

a. Dependent Variable: Annual Milk Revenue in KES

Source: Researcher Data 2024

CHAPTER FIVE: SUMMARY, DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter presents answers resulting from data analysis to examine the extent to which types of records kept, methods of recordkeeping, and frequency of recordkeeping affect dairy farming business performance in Kiambu County with special reference to Kiambaa Constituency. The chapter contains an introduction, summary, discussion, conclusion, recommendations, limitations of the study, and suggestions for further research.

5.2 Summary

The general study objective was to determine the effects of record-keeping practices on dairy farming business performance amongst the smallholder farmers in Kiambaa Constituency of Kiambu County. The focus was on the types of records kept, methods of recordkeeping, and frequency of recordkeeping. The sample size was 400 smallholder farmers and the response rate was 83%.

The descriptive study outcome measured using the five (5) point Likert scale indicated that the respondents somewhat agree with the statements on the type of record kept while they disagree with the statements on the method of recordkeeping and frequency of recordkeeping regarding their effect on dairy farming business performance. The study results indicated that most smallholder dairy farmers earn below Kes. 250,000 annual milk income.

The data was confirmed to be suitable for factor analysis as determined by KMO values of 0.638 and Bartlett's test (1283.392; $p < 0.000$). Confirmatory factor analysis was done which resulted in three factors explaining 67.455% of the total variance in the variables. Type of record kept accounted for 32.721% of the variance, method of recordkeeping accounted for 18.311% of the variance while frequency of recordkeeping accounted for 16.423% of the variance. The correlation analysis results indicated a statistically significant relationship between the independent and dependent variable with the frequency of recording having the strongest relation with

the dairy farming business performance and the type of record kept having the weakest relationship with the dairy farming business performance.

The regression analysis findings revealed that the type of record kept, method of recordkeeping, and frequency of recordkeeping had a marginal positive and statistically significant effect on dairy farming business performance. Frequency of recordkeeping had the highest influence on dairy farming business performance while method of record kept had the least influence.

5.3 Discussion of findings

5.3.1. Extent to which type of record kept affect dairy farming business performance

The first research objective under examination in this study was to examine the types of records kept among smallholder farmers in the Kiambaa constituency. The findings showed that the respondents somewhat agreed with the statements on the type of record kept with an overall mean score of 3.26 and a standard deviation of 1.014. This implied that to some extent smallholder farmers in the Kiambaa constituency understand the importance of keeping farm records. This finding is consistent with Kahan (2013) who argued that when a farmer practices recordkeeping as one of the management strategies then they will be able to know their business weakness and get an opportunity for improvement. This provides a platform for self-evaluation and may thus be useful in enabling the farmers to set business targets as envisioned in the profit maximization and competition-based strategy.

The respondents agreed to the statement that they keep health records for their dairy businesses giving the highest mean score of 3.77 and a standard deviation of 0.974. However, they somewhat agreed with the statement that they keep farm input records for their dairy businesses giving the lowest mean score of 2.59 and a standard deviation of 1.099. This suggests that most smallholder dairy farmers in the Kiambaa constituency prefer keeping health records for their dairy cows as compared to the records for inputs used in their farms. This is in line with Tebug et al. (2012) and Mwanga et al. (2018) who concluded that health records were the most kept while feeding records were kept least. Most probably this is to track and prevent occurrence of diseases and herd fertility as suggested by Costa et al. (2012).

The study result indicated that the type of record kept had positive and statistically significant effect on dairy farming business performance whereby for every increase in the type (number) of records kept, the rate of dairy farming business performance would be positively affected by 0.306 units using the standardized coefficient. This imply that the smallholder dairy farmers kept different records from each other and that the more the smallholder dairy farmer diversify the type of records kept, the more the dairy business performance improved. The range of record diversification in this study included the cattle identification, farm input, production, health, financial and animal feed records. This finding conforms to findings by Dudafa (2013) who found that smallholder farmers who practice recording concentrate mainly on sales and production though the type of records kept is never standardized. A farmer can therefore lower his business costs as envisaged by the porter's generic strategies and profit maximization and competition-based theory by tracking the different aspects of his business using different types of records to enhance business performance.

5.3.2 Extent to which methods of record keeping affect dairy farming business performance

The second research objective under examination in this study was the assessment of the methods of record keeping among smallholder farmers in the Kiambaa Constituency. According to the analysis of the five (5) point Likert scale, the respondents disagreed with the statements on methods of record keeping with an overall mean score of 2.38 and a standard deviation of 1.216. This implied that smallholder dairy farmers in Kiambaa Constituency do not have a standard recordkeeping method.

The respondents somewhat agreed with the statement that they use hand system/manual methods to record dairy farm data giving the highest mean score of 3.07 and a standard deviation of 1.156. However, the respondents disagreed with the statement that they use both computer/automated and hand/manual systems to record their farm data giving the lowest mean score of 1.88 and a standard variation of 1.250. These findings were inferred to mean that most smallholder dairy farmers in Kiambaa Constituency use manual methods for keeping farm records. This concurs with, Prajapati et al. (2015) and Jeyabalan (2010) who concluded that many smallholder

dairy farmers who keep records did it manually, and computerized systems were rarely utilized nor prioritized.

The study outcome indicated that the method of record keeping had positive and statistically significant effect on dairy farming business performance whereby for every positive change in the methods of record keeping, dairy farming business performance would positively change by 0.104 units using the standardized coefficient. This implies that as smallholder dairy farmers change from manual to computerized methods of record keeping their dairy farming business performance improved. This finding is consistent with Moran (2009) who found that manual system is time consuming especially where decision have to be retrieved and actioned in a short time and that computerized systems are considered to be accurate and powerful analysis tools compared to hand systems, thus helping the farmers make informed decisions that eventually translate into better performance. As perceived by Porter's differentiation strategy, this means that the farmers can use technology in record keeping to differentiate and improve their business revenues.

5.3.3. Extent to which frequency of record keeping affects dairy farming business performance

The third research objective under examination in this study was to assess the frequency of record-keeping among smallholder farmers in the Kiambaa Constituency. According to the analysis of the five (5) point Likert scale, the respondents disagree with the statements on the frequency of record keeping with an overall mean of 2.25 and a standard deviation of 1.254. This finding implied that the frequency of recordkeeping varies from one smallholder dairy farmer to another in Kiambaa constituency.

The respondents somewhat agreed with the statement that they update their data daily (every day) and monthly, giving the highest mean scores of 2.94 and 2.72, and a standard deviation of 1.482 and 1.297 respectively. The respondents disagreed with the statement that they update their data biannually (once every six months) giving the lowest mean score of 1.63 and a standard deviation of 0.988. This can be inferred to mean that the smallholder dairy farmers update their data though it may not be daily.

The findings agree with with Tham-Agyekum et al. (2010) who found that most farmers updated records on a daily basis.

The study findings showed that the frequency of recordkeeping had the highest positive and statistically significant effect on dairy farming business performance whereby for every unit increase in the frequency of recordkeeping, dairy farming business performance would increase by 0.374 units using the standardized coefficient. These findings are consistent with Jeyabalan (2010) and Dudafa (2013) who found that farmers who update their records regularly stand a better chance of having higher productivity compared to those who don't and that the frequency of recordkeeping is a key determinant of dairy farm success. This can be inferred to mean that farmers who maintain frequent records are able to continually monitor their revenues and costs, and eventually make timely decisions that result to revenue maximization, as envisaged by the profit maximization and competition-based theory.

5.4. Conclusion

The study examined the effects of recordkeeping practices on dairy farming business performance in Kiambu County: a case of Kiambaa Constituency. The general conclusion is that the type of record kept, frequency of recordkeeping, and method of recordkeeping had a positive and statistically significant effect on dairy farming business performance.

The frequency of record keeping contributed the greatest influence on dairy farming business performance while the method of record keeping had the least influence on dairy farming business performance. This can be inferred to mean that irrespective of the type of records kept and method used to keep them, farmers who frequently keep records that they view to be most critical use them to make sound business decisions, which in-turn result to high revenues and profits as postulated in the profit maximization and competition-based theory. This is in line with findings by Gichohi (2020) that the nature of decisions that are made using dairy farm records statistically and significantly affect output, and that a dairy farmer must keep accurate records and use them to make sound business decisions in order to maximize profits.

The type of records kept, which had the second highest influence on dairy farming business performance, can be inferred to mean that keeping more types of records gives a chance to more diversified business analysis and consequently results to better dairy revenues which maximizes profit and competition in smallholder dairy business as postulated in the profit maximization and competition-based theory. In this way, record keeping becomes a differentiation strategy as postulated by Porter's generic strategies.

Therefore, it is critical that smallholder dairy farmers keep records frequently and use them appropriately to maximize their revenues and profits, and cut an edge above the rest.

5.5. Recommendations of the Research Study

The following recommendations are made based on the theoretical literature, empirical assessment, and research findings. The recommendations will be relevant to the County government of Kiambu, smallholder dairy farmers, financial institutions and service providers.

5.5.1. County Government of Kiambu

The respondents somewhat agreed with the statement that they keep farm input records for their dairy businesses giving the lowest mean score of 2.59 and a standard deviation of 1.099. They disagreed with the statement that they use both computer/automated and hand/manual systems to record their farm data giving the lowest mean score of 1.88 and a standard variation of 1.250. This implied that a majority of the smallholder farmers in the Kiambaa Constituency do not keep farm input data and have not automated their recording. Therefore, it is recommended that the County Government of Kiambu conduct intensive smallholder dairy farmer training on the importance of record keeping and digital literacy through the extension department since agriculture is a devolved function.

5.5.2. Smallholder dairy farmers

The respondents disagree with the statements on the frequency of record keeping with an overall mean of 2.25 and a standard deviation of 1.254. This finding implied that the frequency of record-keeping varies from one smallholder dairy farmer to another

in Kiambaa constituency. Therefore, it is recommended that smallholder dairy farmers consider updating their records on daily basis in order to accrue the benefits that come with use of real-time information.

5.5.3. Financial Institutions and Service Providers

The general conclusion is that the type of record kept, frequency of record keeping, and method of record keeping have a positive and statistically significant effect on dairy farming business performance. Therefore, it is recommended that financial institutions like KDFCS should sensitize the farmers on the importance of good recordkeeping practices. System developers should also come up with simple systems that would enable daily recording by the smallholder farmers.

5.6. Limitations of the study

The study employed quantitative data which may not be sufficient to offer insights into more thoughts, motivations, drivers and challenges of the recordkeeping practices. Future studies should employ multiple methods, and source data from different stakeholders and experts with an aim of developing an all-inclusive understanding of the dairy sector.

This research covered only Kiambaa area while there are also other areas in Kiambu County where smallholder dairy farming is highly practiced. This was necessitated by scarcity of study resources. Future well-funded studies should be expanded to the whole county in order to help the study get better insights and generalization.

5.7. Suggestion for further research

The items used to describe the type of records kept, method of recordkeeping, and frequency of recordkeeping in this study and those used to measure dairy farming business performance may not have been exhaustive. The findings add to the existing empirical and conceptual literature on the effects of record-keeping practices on dairy farming business performance, in particular, a selection of aspects of the type of recordkeeping, method of recordkeeping, and frequency of recordkeeping. Future studies should consider the inclusion of other aspects of the type of recordkeeping, method of recordkeeping, and frequency of recordkeeping not covered in this study to

help bring out more empirical evidence on the effects of record keeping practices on dairy farming business performance.

Future studies may also explore the determinants of, and challenges in record-keeping practices, as well as other factors that affect the dairy farming performance beyond the recordkeeping practices. Therefore, there is a need for further study to explore other factors and measures to enhance the robustness of the study models and the generalizability and validity of the results. Future studies should also cover the larger Kiambu County in-order to gain better insights.

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APPENDICES

Appendix I: Research participation and consent form

Study: Effect of record keeping practices on dairy farming business performance in Kiambu county: a case of Kiambaa constituency

SECTION 1: INFORMATION SHEET

Principal Researcher: Ms. Agatha Wanjiku Wahome

Institutional affiliation: Strathmore University Business School

SECTION 2: INFORMATION ON THE STUDY

2.1. Objective of Study

The general objective of this study is to determine the effect of record keeping practices on dairy farming business performance amongst the Small Holder Farmers in Kiambaa constituency

2.2. Must I take part in the study?

Taking part in this study is purely voluntary. If you decide to take part, you will be asked to answer some questions about how you keep records and how your business performs. Your answers shall be recorded in a questionnaire. You are free to decline to take part in this study at any time without giving any reasons.

2.3. Who is eligible to take part in this study?

Smallholder dairy farmers who are members of Kiambaa Dairy Farmers Cooperative Society with one (1) to five (5) cows.

2.4. Who is not eligible to take part in this study?

Non-members of Kiambaa Dairy Farmers Cooperative Society and members of Kiambaa Dairy Farmers Cooperative Society currently having no (zero) or with more than five (5) dairy cows.

2.5. What is required of me in the study?

A research assistant will brief you about the study. If you are satisfied and willing to participate, you will be asked to sign this form, after which you will be asked the questions as per the questionnaire. The research assistant will enter your answers in the questionnaire.

2.6. Are there any risks or dangers in taking part in this study?

There are no risks in taking part in this study. All the information you provide will be treated as confidential and will not be used in any way without your express permission.

2.7. Are there any benefits of taking part in this study?

The information will be used to improve record-keeping practices in dairy farming.

2.8. Who will have access to my information during this research?

All your information will be kept confidential. Only the people who are closely concerned with this study will have access to your information.

2.9. Who can I contact in case I have further questions?

You can contact me, Ms Agatha Wanjiku Wahome through e-mail wahome.agatha@strathmore.edu or phone +254 722 958 805.

You can also contact my supervisor, Dr. David Mathuva, at the Strathmore Business School, Nairobi, or by e-mail dmathuva@strathmore.edu or by phone +254 710 403 501.

If you want to ask someone independent anything about this research, please contact: The Secretary–Strathmore University Institutional Ethics Review Board, P. O. BOX 59857, 00200, Nairobi, email ethicsreview@strathmore.edu Tel number: +254 703 034 375.

To be completed by the respondent

I have read and understood all that has been explained to me about the study and had my questions answered satisfactorily.

Please tick the boxes that apply to you; Participation in the research study

[ ] I AGREE to take part in this research

[ ] I DO NOT AGREE to take part in this research

Participant's Signature: _____Date: ___/___/__ Time: ___/__

dd /mm/ yy hr / mn

Research assistant's Signature: _____Date: ___/___/__ Time: ___/__

dd /mm/ yy hr / mn

Appendix II: Questionnaire

SECTION A: BACKGROUND INFORMATION

What is your gender? Male [ ] Female [ ]

SECTION B: FARMER'S BUSINESS PERFORMANCE

This section is to be answered by every farmer

BP_1. What is your annual milk revenue from your dairy business in Kenya Shillings? (Tick where appropriate)

Below 250, 0000 [ ]

250,000 – 500,000 [ ]

500,001 – 750,000 [ ]

750,001 and above [ ]

SECTION C: TYPE OF RECORD-KEPT

The following statements relate to the type of records kept. Tick level of agreement or disagreement with each statement on 5 Likert scale where: 1 Strongly disagree, 2 Disagree, 3 Somewhat agree, 4 Agree, 5 Strongly agree.

Statement	**1**	**2**	**3**	**4**	**5**
I keep cattle identification records for my dairy business.					
I keep financial records for my dairy business.					
I keep production records for my dairy business.					
I keep health records for my dairy business.					
I keep animal feeds record for my dairy business					
I keep farm input records for my dairy business					

SECTION D: METHOD OF RECORD KEEPING

The following statements relate to the method you use to record your data, tick level of agreement or disagreement with each statement on 5 Likert scale where: 1 Strongly disagree, 2 Disagree, 3 Somewhat agree, 4 Agree, 5 Strongly agree.

Statement	**1**	**2**	**3**	**4**	**5**
I use computer/automated methods to record my dairy farm data.					
I use hand system/manual methods to record dairy farm my data.					

I use both computer/automated and hand/manual systems to record my dairy farm data					

SECTION E: FREQUENCY OF RECORD KEEPING

The following statements relate to how often you update your data, tick level of agreement or disagreement with each statement on 5 Likert scale where: 1 Strongly disagree, 2 Disagree, 3 Somewhat agree, 4 Agree, 5 Strongly agree.

Statement	**1**	**2**	**3**	**4**	**5**
I update my data yearly (once in a year)					
I update my data biannually (once every six months)					
I update my data monthly (once every month)					
I update my data weekly (once every week)					
I update my data daily (every day)					

Appendix III: Strathmore University letter of introduction

Strathmore UNIVERSITY
BUSINESS SCHOOL

Ole Sangale Rd, Madaraka Estate,
P.O Box 59857 00200, Nairobi, Kenya.
Cell: +254 703 414/6/7, Twitter: @SBSKenya

Email: info@sbs.ac.ke or vist www.sbs.strathmore.edu

8th February 2024

To Whom It May Concern,

RE: FACILITATION OF RESEARCH – AGATHA WANJIKU WAHOME

This is to introduce Agatha Wanjiku Wahome who is a Master of Management in Agribusiness Student at Strathmore University Business School, admission number MMA/114142. As part of our MMA Program, Agatha is expected to do applied research and undertake a project. This is in partial fulfilment of the requirements of the MMA course. To this effect, Agatha would like to request appropriate data from your organization.

Agatha is undertaking a research paper on "**Effect of Record Keeping Practices on Dairy Farming Business Performance in Kiambu County: A case of Kiambaa Constituency."** The information obtained shall be treated confidentially and shall be used for academic purposes only.

Our MMA seeks to establish links with industry, and one of these ways is by directing our research to areas that would be of direct use to industry. We would be glad to share our findings with you after the research, and we trust that you will find them of great interest and of practical value to your organization.

We appreciate your support and shall be willing to provide any further information if

required.

Yours sincerely,

Njoki Kiagiri
Manager – Graduate Programmes
Strathmore University Business School.

APPENDIX V: Strathmore University ethical clearance

Strathmore UNIVERSITY

2nd February 2024

Ms Wahome Agatha,
wahome.agatha@strathmore.edu

Dear Ms Wahome,

RE: Effect of Record Keeping Practices on Dairy Farming Business Performance in Kiambu County: A Case of Kiambaa Constituency

This is to inform you that SU-ISERC has reviewed and **approved** your above **SU-masters** research proposal. Your application reference number is **SU-ISERC1964/24.**

The approval period is from **2nd February 2024 to 1st February 2025.**

This approval is subject to compliance with the following requirements:

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SU-ISERC.
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SU-ISERC within 72 hours of notification.
iv. Any changes anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to SU- ISERC within 72 hours.
v. Clearance for the export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to the expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days of completion of the

study to SU- ISERC.

Before commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology, and Innovation (NACOSTI) https://research- portal.nacosti.go.ke/ and obtain other clearances needed.

Yours sincerely,

Mr Ambrose Rachier, Chairperson; SU-ISERC

STRATHMORE UNIVERSITY INSTITUTIONAL
SCIENTIFIC AND ETHICAL REVIEW COMMITTEE
(SU-ISERC)
02-Feb-2024
Email:ethicsreview@strathmore.edu
P.O BOX 59857-00200
NAIROBI-KENYA

Ole Sangale Rd, Madaraka Estate. PO Box 59857-00200, Nairobi, Kenya. Tel +254 (0)703 034000 Email admissions@strathmore.edu www.strathmore.edu

APPENDIX VI: National Commission for Science, Technology and Innovation license

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **387256**

Date of Issue: **14/February/2024**

RESEARCH LICENSE

This is to Certify that Ms.. AGATHA WANJIKU WAHOME of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kiambu on the topic: EFFECT OF RECORD KEEPING PRACTICES ON DAIRY FARMING BUSINESS PERFORMANCE IN KIAMBU COUNTY: A CASE OF KIAMBAA CONSTITUENCY for the period ending : 14/February/2025.

License No: **NACOSTI/P/24/33051**

387256

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

APPENDIX VII: Kiambaa Dairy Farmers' Cooperative society management clearance

Dafina

Quality Assured

22nd February 2024

To Whom It May Concern,

RE: FACILITATION OF RESEARCH - AGATHA WANJIKU WAHOME

This is to inform you that Agatha Wanjiku Wahome will be conducting an applied research on the "Effect of Record Keeping Practices on Dairy Farming Business Performance in Kiambu County: A case of Kiambaa Constituency.'·

Kindly accord her the necessary assistance required. Thank you

Kind regards

KIAMBAA DAIRY F.C.S. LTD
P.O. BOX 3 KARURI
Tel 066-50340/51342

JOSEPH GICHINGA NGANGA
AG. GENERAL MANAGER

Kiambaa Dairy Farmers Co-Operative Society
P.O. Box 3 - 00219 - Karuri : info@kiambaadairy.com : +254 710 818005

Appendix VIII: Research work plan

Activities	Duration
Research project proposal development and approval	4 weeks
Literature Review	12 weeks
Developing the data collection instrument	1 week
Fieldwork	2 weeks
Data analysis and period up to research report approval	2 weeks
Period up to defense presentation of research report findings	2 week
Development of final project work and submission to research coordinator at SBS	4 weeks

Source: Researcher 2023

Appendix IX: Research budget

STUDY BUDGET				
Item	**Quantity**	**Days**	**Rate (Ksh.)**	**Total**
Research Assistants				
Researcher's wages	10	5	1,000	50,000.00
Researcher's Refreshment	10	5	100	5,000
Researcher's Transport	10	5	300	15,000
Researcher's Communication	10	5	200	10,000
Guides stipend	10	5	300	15,000
Subtotal				**95,000**
Printing				
Printing of research tools	800	1	10	8,000.00
Project Printing	100	1	10	1,000.00
Project binding	1	1	500	500.00
Internet	1	1	3,000	3,000
Equipment hire	1	1		8,500
Subtotal				**21,000**
Grand total				**116,000.00**

Source: Researcher 2024

Appendix X: Study results dissemination plan

Stakeholder	Timeline	Mode
County Government of Kiambu	27th May 2024 to 30th May 2024	Presentation of the finding to the department of Agriculture, Livestock and Irrigation in the County government of Kiambu.
Smallholder farmers	27th May 2024 to 3rd June 2024	Collaboration with the extension officers of Kiambaa Dairy Cooperative society (KDFCS), as well as Kiambaa sub-county officer.
Financial institutions	27th May 2024 to 21st June 2024	Sharing the research insights with Kiambaa Dairy Farmers Cooperative Society's (KDFCS) management.

Source: Researcher 2024